Iota SIM card Interface

APN04
Ver 1.0

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Department: EWTBU

	Originator	Approval	Quality
Name	Lorenzo Indiani	Philippe Perney Jose Yp-Tcha	Deborah Rouchouse
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Signature			

HISTORY

Version	Date	Author	Notes
Ver: 1.0	04/02/02	Lorenzo Indiani	1
Ver: 2.0			2
Ver: 3.0			3
Ver: 4.0			4

NOTES :

1. Creation
2. ……..
3. ……..
4.

GLOSSARY

REFERENCE DOCUMENTS

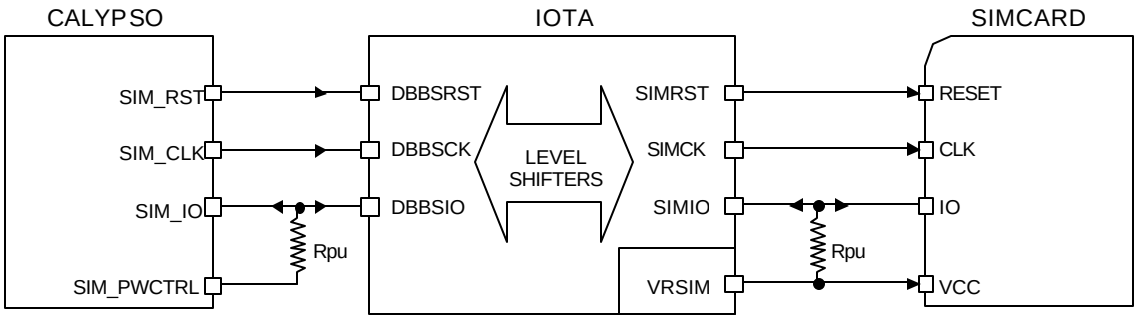
[1] APN0 Calypso/Iota/Clara System application note ver 1.1
[2] CAL207 Calypso register mapping ver 0.8
[3] TWL3014 Iota specification ver 2.0

TABLE OF CONTENTS

LIST OF FIGURES

1 The Iota SIM card interface

The Iota SIM interface is composed by a dedicated LDO and I/O level shifters. It is able to support 3V and 1.8V SIM cards.



1.1 Iota SIM card interface – Block schematic

1.1 The VRPCSIM control register

SIM card interface is controlled through the VRPCSIM Iota register at address 23 Page 1.

Name :VRPCSIM Description : SIM CARD Control Register										Address : 23 Page : 1					R/W
-	-	-	-	-	-	SIMLEN	SIMRSU	RSIMEN	SIMSEL	1	0	1	1	1	1 / 0
R	R	R	R	R	R	R/W	R	R/W	R/W	<--- ACCESS TYPE					
0	0	0	0	0	0	0	0	0	0	<--- VALUE AT RESET					

SIMSEL : Select VRSIM output voltage
'1' => 2.9 V '0' => 1.8V
RSIMEN : Enable the RSIM regulator
SIMRSU : VRSIM regulation status
'1' => regulation is ON, the SIM interface is correctly supplied
'0' => the regulator is not yet in regulation mode
SIMLEN : Enable the SIM interface level shifter (SIMCK, SIMIO, SIMRST are enable)

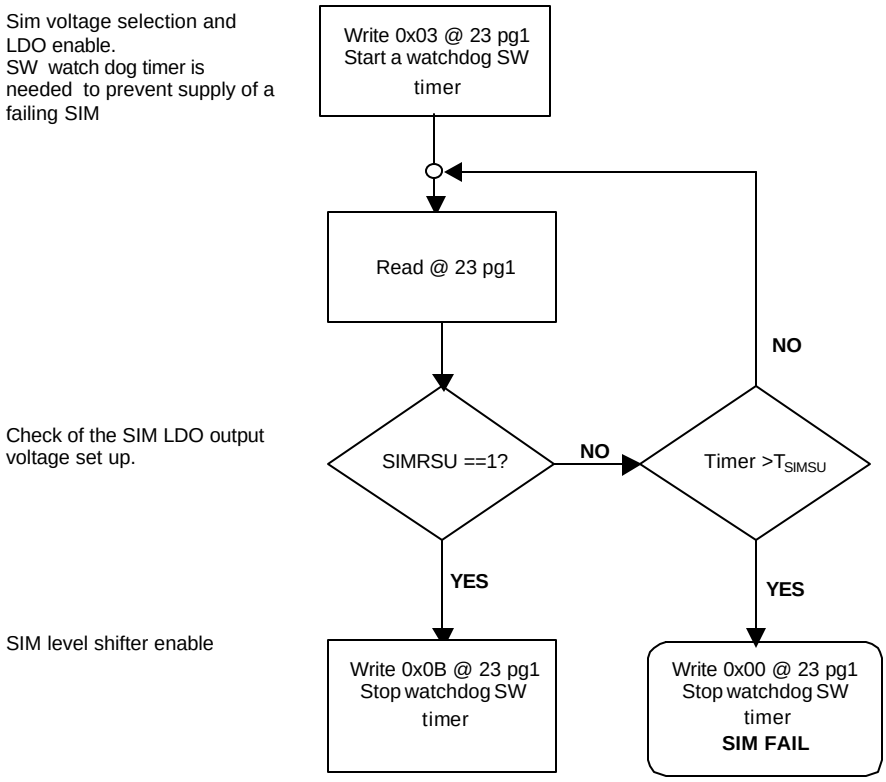
The VRPC state machine does not automatically enable SIM LDO at start up, its enable has to be done in the SIM initialization routine.
A particular enable sequence must be respected in order to grant a proper initialization of the interface.

1.2 The SIM interface enable sequence

As the SIM LDO is not enabled care should be paid to level shifter enable respect the presence of the SIM power supply. For that reason correct enabling sequence is the following:

1. Selection of the SIM voltage and enable of the SIM LDO(SIMSEL and SIMEN bits).
2. Wait for the SIM LDO output voltage set up (SIMRSU bit).
3. Enable SIM level shifter when SIMRSU = 1 (SIMLEN bit).

Assuming a 3V SIM to be driven this could be the flow diagram of the interface enabling SW.



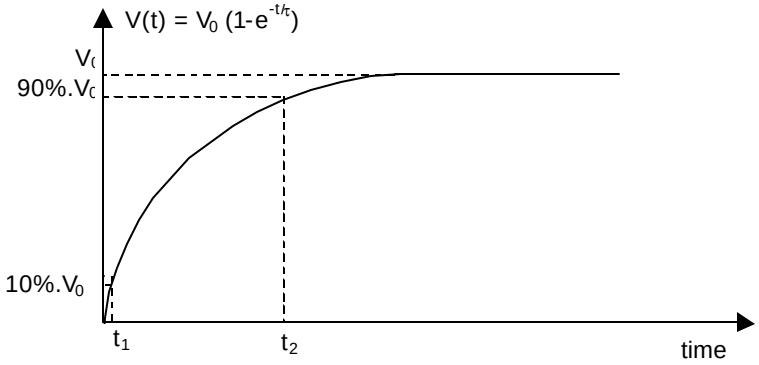
1.2 SIM enabling flowchart

The T_{SIMSU} parameter is related to the SIM LDO setup time. Typical value for LDO set up time is less than 4 ms.

2 Selection of the pull up resistor for the SIM interface

Selection of pull-up resistor is trade-off between the SIM IO rising time and current consumption. Indeed, during the transmission of a low state from the SIM card to the DBB or from the DBB to the SIM card, the current consumption of the I/O interface is VRIO/R + VRSIM/R.

Relation between the rising time and the pull-up resistor could be evaluated considering the I/O rising time as $t_r = t_2 - t_1$



1.3 SIM IO Pull up calculation

Where

$90\%V_0 = V_0 (1 - e^{-t2/\tau}) \Rightarrow t_2 = -\tau \ln (0.1)$

$10\%V_0 = V_0 (1 - e^{-t1/\tau}) \Rightarrow t_1 = -\tau \ln (0.9)$

$$t_r = t_2 - t_1 = \tau [\ln (0.9) - \ln (0.1)] = 2.19\,\tau$$

with $\tau = RC$,

C is the output capacitance and R is the pull-up restor.

So, if C_{max} = 70pF and t_{rmax} = 1us => R_{max} = 6.52kohms or if

C_{max} = 30pF and t_{rmax} = 1us => R_{max} = 15.2 kohms

Rise time and load capacitance constraints for each interface signal are described in APN0 [1] please check paragraph 7.1.1 page 42.

3 Interface configuration during off and sleep modes

3.1 OFF Mode

When SIMLEN is low, level shifters are disabled, SIMIO is driven to a low logical state. In that case VRSIM is connected to ground via the pull-up resistance.

3.2 Sleep Mode

During sleep mode the SIM interface assumes the following configuration:

Iota VRRSIM enabled
Iota level shifters enabled
Calypso SIM_RST signal at the inactive level (logic one)
Calypso SIM_CLK freeze at high or low level (depending on SIM card)
Calypso SIM_IO in input mode (Pulled up at high logical level through Rpu)
Calypso SIM_PWCTRL at high logical level.

In this configuration Sleep consumption of the SIM interface is mainly related to the SIM card leakage current.